

## Nutrient supply and productivity in organic forage and milk production - improved forage production and utilization based on local resources

Organic milk production in Norway has become more intensive, which, among other things, has led to increased focus on forage quality. The primary growth (PG) is harvested at an earlier stage of development with the consequence that more than half of the total yearly yield is from the regrowth (RG, second and third cuts). The RG contains a high proportion of clover. Thus, the RG forage has likely high crude protein content, while the PG forage has high energy value but low protein content. The use of fish meal as feed to ruminants is now prohibited, also in Norway, and alternative feed protein sources are expensive. The value of on-farm grown forage is therefore becoming even higher.

The project aims to bring to light knowledge that makes dairy farmers better prepared to produce forage in high quantities and qualities as allowed by local climate and resources, adapt forage and milk production better to these constraints, and assess the economics, resource use and environmental impacts linked to forage production and feed ration with high forage quality. Specifically, the research conducted in the project seeks to answer the following questions:

- Little is known about the yield and forage quality formation in RG and how the RG should be divided between a second and a third cut under different climatic conditions. So when ought the RG to be harvested?
- Are early red clover varieties better suited than late ones in intensive harvesting regimes when it comes to sustain high yields and to even out differences in forage yield and quality between cuts?
- Will other grasses than timothy and meadow fescue perform better as companion species to red clover under intensive harvesting regimes? Are grass species and variety mixtures that are less synchronous in generative development better?
- How should forage with high clover proportion be preserved in order to ensure high preservation of the forage protein?
- Is it possible to utilize that PG and RG silages have different feed quality by mixing them when fed? What is the best proportion of respective types in rations for high yielding cows?
- What is won and what is lost in economic terms when applying intensive harvesting regime?
- Will a mixing of PG and RG silages at feeding reduce methane emission and nitrogen loss in the cow and from the slurry storage?

The primary objective is to improve the basis for tactical and strategic choices in the production, use and utilisation of grassland forage in organic milk production.

Secondary objectives are to:

1. Evaluate the potentials and options for legume based boosting of grassland yield
2. Evaluate the RG yield and quality formation
3. Evaluate diets to high yielding dairy cows - balancing PG and RG grass/red clover silage
4. Evaluate the effects of different dietary mixtures of PG and RG on enteric methane emissions and methane and N emissions from slurry storage
5. Assess the economics and resource use in forage production systems with early cut of PG
6. Assess the environmental impacts of changing to forage production systems with early cut of PG